2.0 Proposed Action and Alternatives

BPA is studying two alternatives to meet the need for this project, the Proposed Action and the No Action Alternative.

2.1 Proposed Action

BPA is proposing to fund the Kootenai Tribe of Idaho, in partnership with the Idaho Dept. of Fish and Game, to add nutrients (nitrogen and phosphorus) to the Kootenai River ecosystem for up to 5 years. The goal of this project is to enhance native fish populations and river health affected by the construction and operation of Libby Dam. The nutrients are expected to stimulate production in the Kootenai River's depleted food web and reverse downward trends in fish populations such as trout, kokanee, mountain whitefish, burbot, and white sturgeon. These agencies propose to add controlled amounts of nitrogen and phosphorus during the natural river-growing season (late June – through September). The nutrients would be added to the river in Idaho through a system of gravity-fed tanks and outflow pipes on a site near Leonia, Lincoln County, Montana (see Figures 1, 2, 3A and 7) and would disperse with river flow (Figure 4). The nutrients would be added to the river from the Montana side, across the Montana/Idaho state boundary, into Idaho state waters. Although supportive of the project goal, representatives of the State of Montana have requested that the nutrients not be discharged into their waters (Dunnigan, November 2003). Montana has more recruitment in the tailrace below Libby Dam than Idaho, the tailrace fishery is much more productive, and densities of trout are higher. Currently, the rainbow trout density in the Idaho reach of the Kootenai River is an order of magnitude lower than in the Flower-Pipe reach of Montana. The average age-2 and older density in the Flower-Pipe reach was 662 trout/km for 1993, 1994, and 1999, while the density at Hemlock Bar, Idaho for the same years averaged 47 trout/km (Paragamian, 1995a and b; Downs 2000; Walters and Downs, 2001; J. Dunnigan, 2003). Lower densities likely contribute to the lower angler catch rates in Idaho.

This proposed project would be temporary and would be monitored during the application period, then re-evaluated after 3-5 years. If the project has positive results, the International Kootenai River Ecosystem Recovery Team (IKERT) would discuss whether to propose continuing the program. The IKERT includes the following organizations and individuals on the recovery team: the Kootenai Tribe of Idaho, IDFG; MFWP, British Columbia Ministry of Environment, Land, and Parks (BCMELP); Army Corps of Engineers (Corps); and the Universities of British Columbia (UBC), Idaho (UI), and Idaho State (ISU). Any continuation of the program would be subject to further environmental analysis and documentation.

2.1.1 Nutrients, Mixing Zone, and Affected Waters

Liquid urea ammonium nitrate (28-0-0) and ammonium poly-phosphate (10-34-0) would be added to the river from a tank storage and delivery-pipe system. (The three numbers refer to the percentage of nitrogen, phosphorus, and potassium in the nutrient solution.) About 16 L/hr of phosphorous and 95 L/hr of nitrogen (depending on flow year) would be added over the treatment season. The ratio of nitrogen and phosphorus to be added (approximately 20:1 N:P) was derived based on the nutrient levels in an unaltered, healthy river, and reflect the standard ratios that would most likely be in the river without the influence of Libby Dam and other human activities, and a maximum amount that would render the additions ineffective. The turbulence caused by the jet of fluid exiting the pipe would do the initial mixing (dilution), and the turbulence from the moving water in the river would continue to mix the nutrients into the water. The effective distance of the treatment would be from about the Montana border (**river kilometer** [rkm] 276) downstream to Bonners Ferry (rkm 248; Ashley, July 21, 2004). The river contour in this area is a good location for treatment because it is shallow. Shallow stretches of river are better nutrient treatment locations than deep areas because adequate light can penetrate to the river bottom allowing algae growth to occur. Since the effective distance of the nutrients matches the distance of river that managers feel the nutrients would work best (i.e., the potential **autotrophic** and nutrient-spiraling **reach**), only one nutrient drip station would be needed to effectively treat the Idaho portion of the Kootenai River.

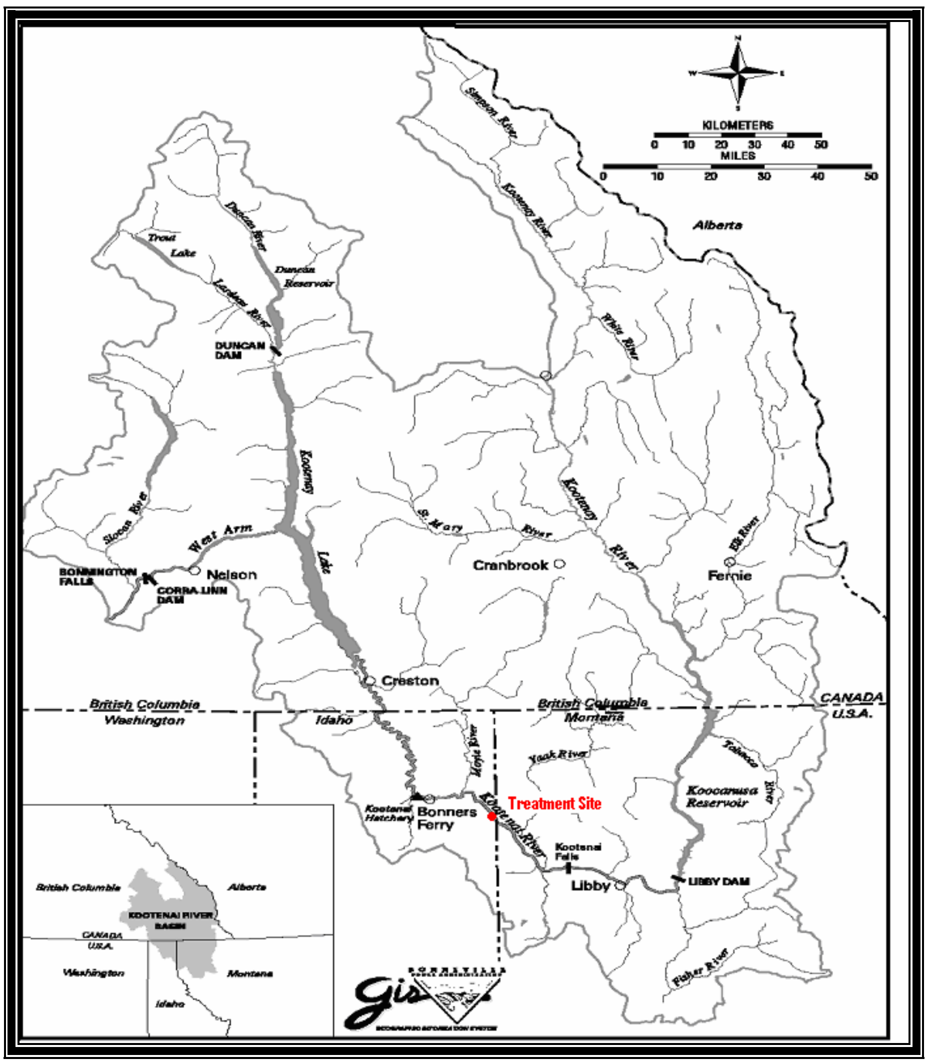

Figure 1 Kootenai River Basin and Treatment Location

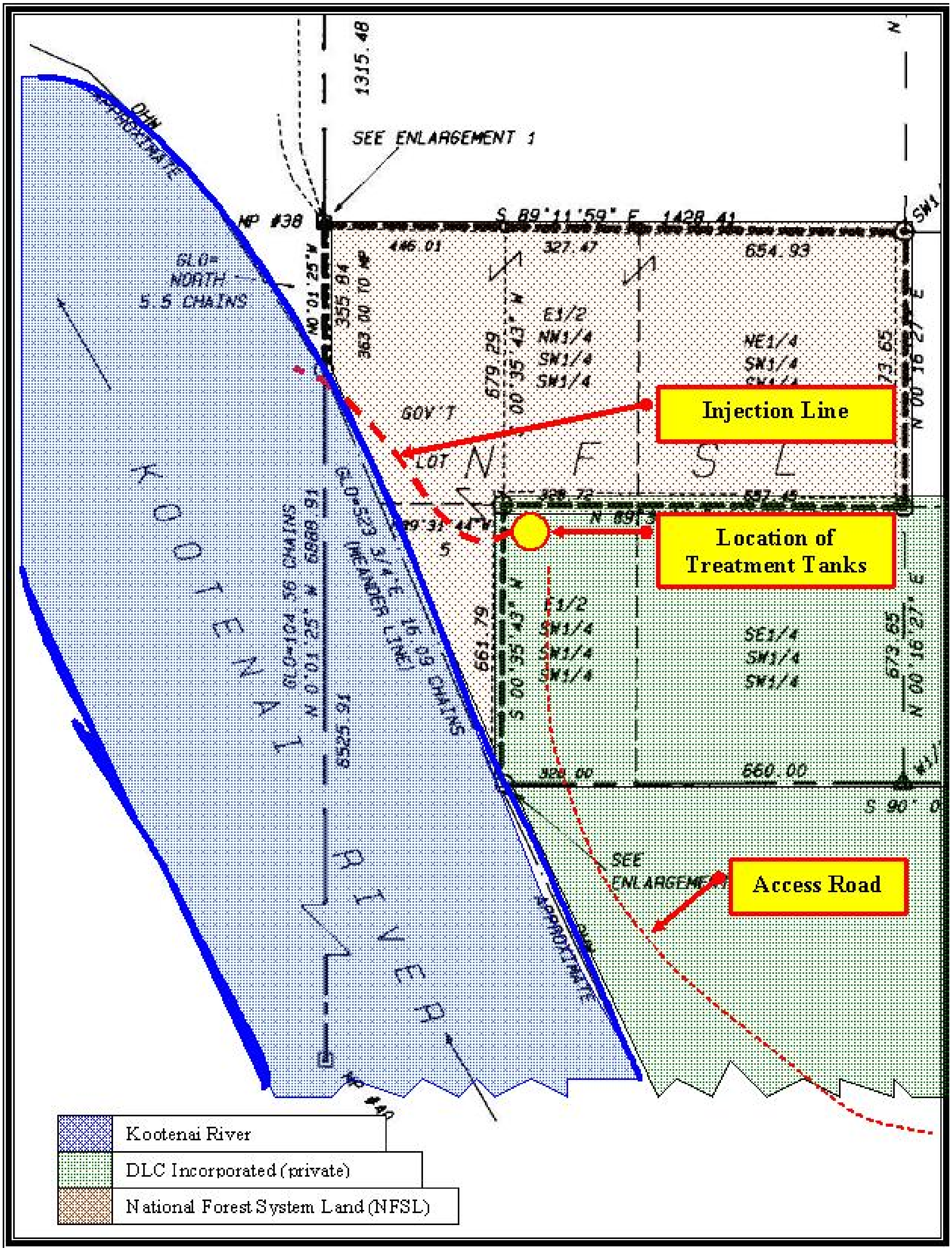

Figure 2 Proposed Action Site Map

~~Figure 3 Schematic of the Proposed Nutrient Enrichment System~~

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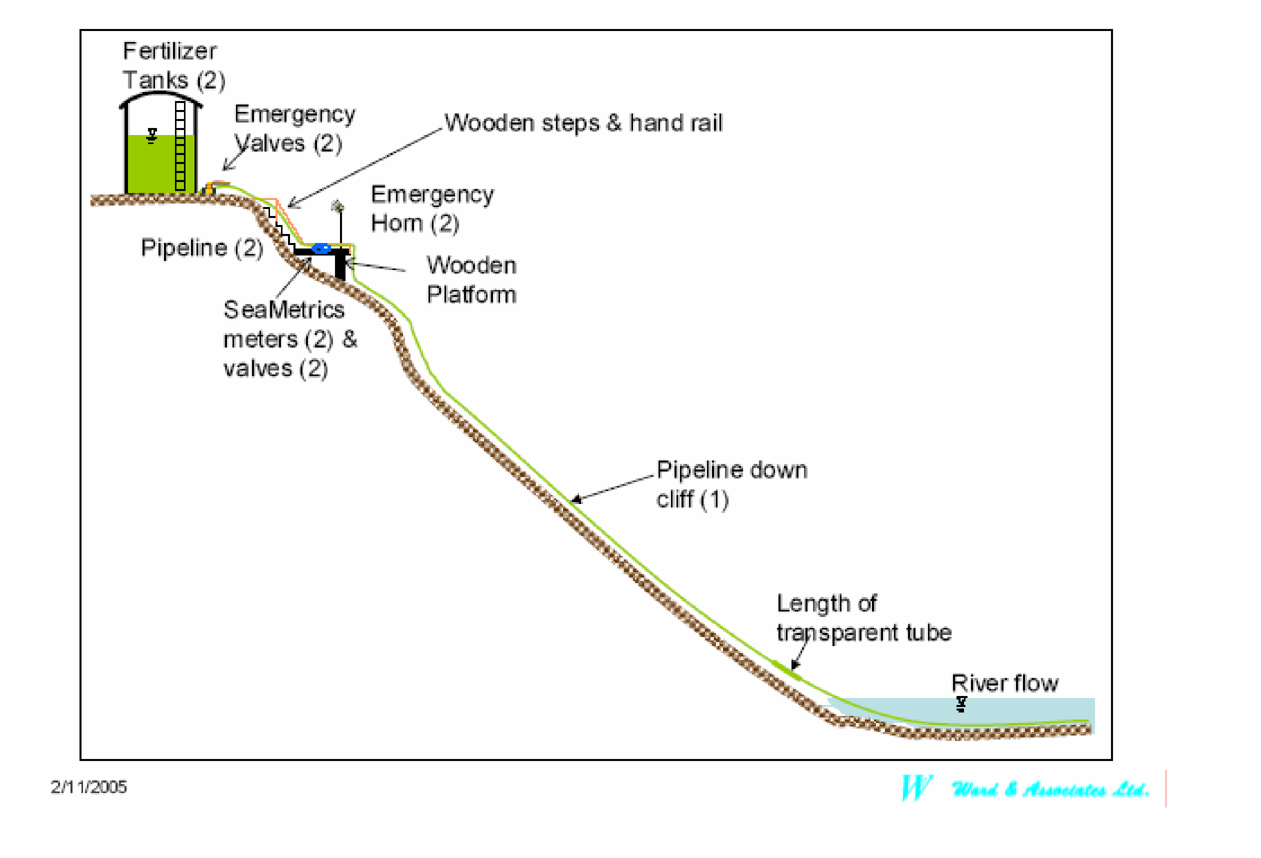


Figure 3A Nutrient Application Pipeline and Tank System for Gravity-Fed Flow

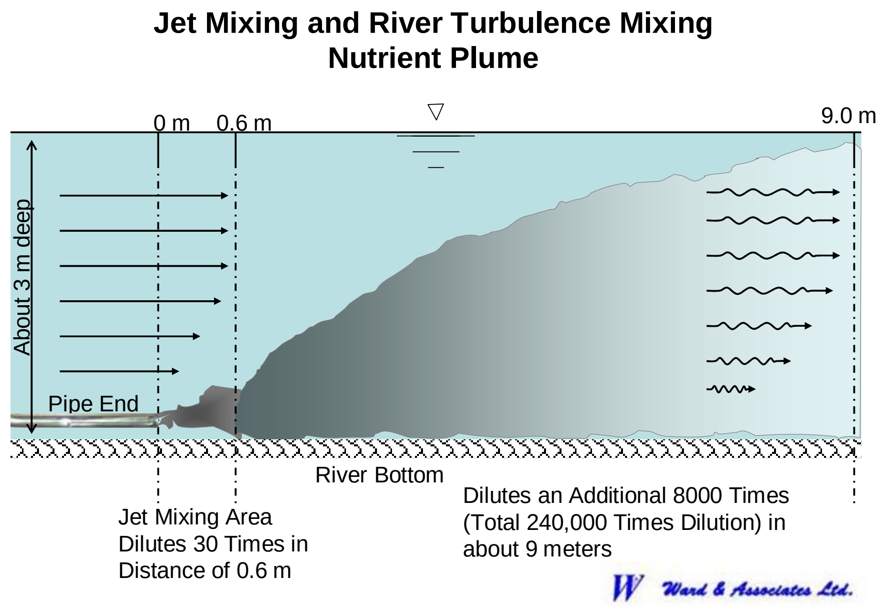


Figure 4 Schematic of the Mixing Zone

Benefits from indirect effects of the nutrients downstream of this area, such as increased insect and algal biomass, could help fisheries in the lower river reach from Bonners Ferry to Kootenay Lake, B.C.. See the Biological Assessment (available on request) for detailed information about mixing zone determinations.

2.1.2 Access Road, Holding Tanks and Pipeline, Operations and Maintenance

The proposed nutrient treatment site is near Leonia, Lincoln County, Montana (see Figures 1, 2, and 7). This site is just north of the Leonia Bridge and east of the Montana/Idaho state border. The access road to reach the site crosses Kootenai National Forest System Land and private property. Part of the access road, the Leonia Road, travels from Highway 2 and descends to the Kootenai River at a now impassable bridge. Before Leonia Road begins its descent from this bench above the river, an un-improved road forks to the north along the bench at about 610 m of elevation on property owned by DLC, Inc. (a private landowner). This road continues to the proposed location for the treatment tanks, which is on private property.

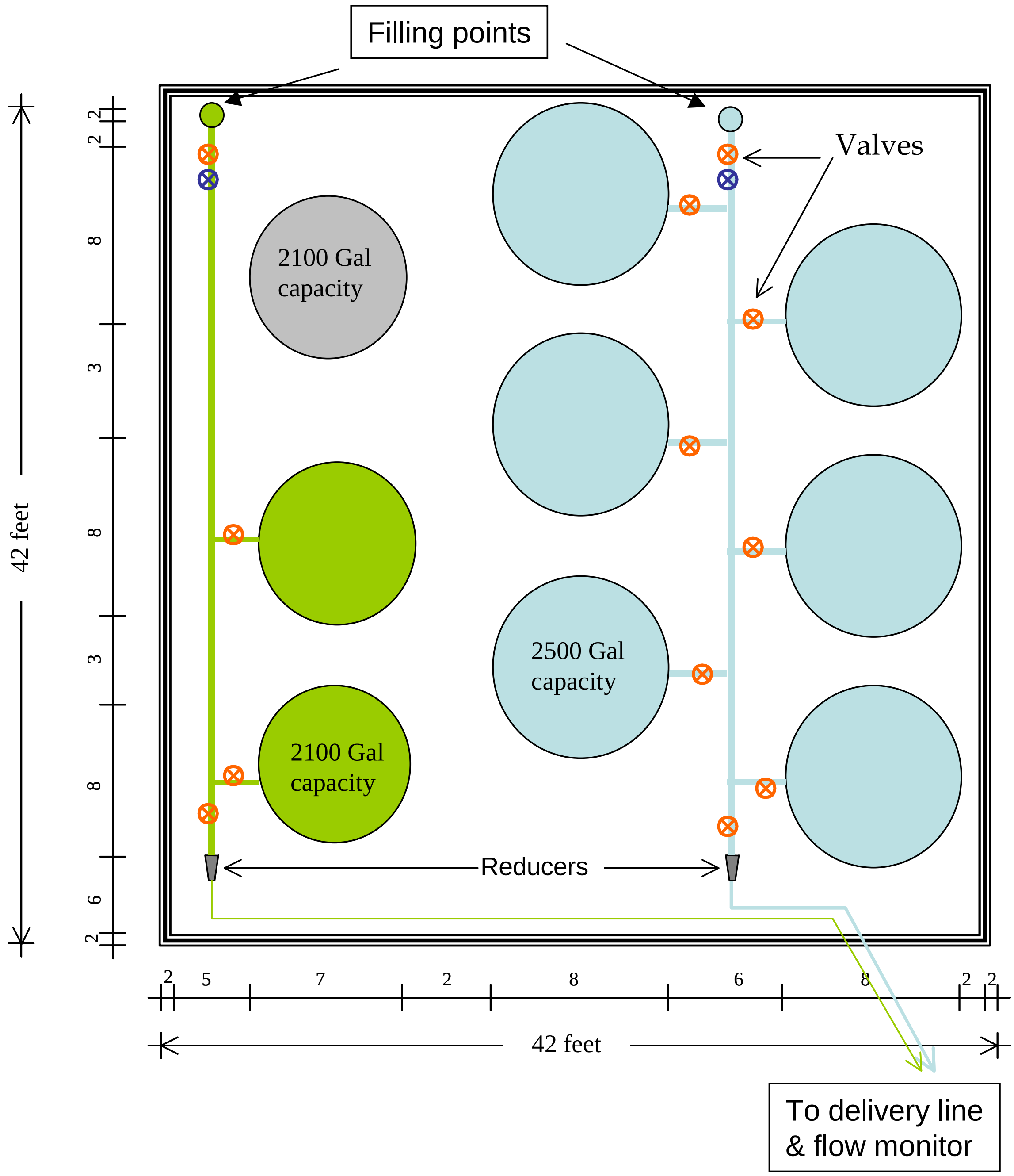
An area about 20 x 30 m would be needed for the treatment equipment. Minimal construction would be needed. The access road would be improved from the fork at Leonia Road, approximately 1 km to the edge of the bench where the nutrient tanks would be. The access road would require gravel fill to allow truck access (see Section 1.6). A truck turn-around for refilling the tanks would be made near where the tanks would be placed. The truck turn-around site would require tree removal, leveling, and gravel fill.

A gravel pad would be constructed for the nine treatment tanks. Of these tanks, two slightly smaller tanks (7,947 L each) would be used for phosphate storage, and there would be seven additional tanks (9461 L each) (see Figure 5). One of these seven has two purposes: it would be used for storing water for clean-up following the treatment season, and it would be used to store any spilled or leaked nutrients if a leak occurs. The other six tanks would be used for nitrate storage. The pad would be about 12.8 x 12.8 m (3 tanks long x 3 tanks deep perpendicular to the river rim). To contain any leaks that may occur in the holding tanks, the ~~holding~~ tanks would have a berm around them created with sandbags or concrete lock blocks (0.6 m x 0.6 m x 1.2 m). The tank pad would be covered first with a layer of sand, then a felt matt, then with a thick plastic liner. Any material that might leak from a tank would be contained by the plastic liner to assist with product recovery if a spill occurs. The tanks would be filled at the beginning of the treatment season, then refilled 2-4 times while the project is underway (July – September), depending on need.

The tanks would be surrounded by a chain-link fence with neutral-colored blinds and the individual tanks would be a color that would blend into the surrounding area to lessen visual effects and decrease the risk of vandalism. To prevent wind damage and reduce the risk of fire, the area around the tanks would be cleared (1-2 average tree heights). At the end of each treatment season (September), the tanks would be emptied.

About 70 m of High Molecular Weight (HMW) plastic (25-50 mm) pipe would extend from the tanks, following the slope of the land above ground down to the riverbank. An additional 250 m of pipe would run at an angle from the riverbank to the river bottom to deliver nutrients (see Figure 2). The pipe would be secured to the bottom of the river (about 2-5 m deep at the time of treatment) with concrete weights. The proposed pipe is relatively flexible and will conform to the contour of the riverbank. About 3/4 of the pipeline would be on National Forest System Land and the remaining amount of pipe would be below the high water mark (state of Idaho-managed land). After the treatment season, the pipe in the river would be removed using a boat and personnel on the riverbank and stored at the IDFG field station on the Kootenai National Wildlife Refuge. The remaining pipe on the slope would not be removed each year. After the treatment is delivered, the pipe on the slope would be emptied and left in place to reduce disturbance on the steep slope. Additional lengths of hose would be available for minor repairs should any leaks occur in the HMW delivery line.

A 3 x 2 m wood platform about 10 m downhill from the main tank location on private land would house control valves and the main safety alarms for the application system. The battery, gate valves, and sea-metric meters would be housed in a locked, metal rectangular box on the wood platform (see Figure 3A). Two photovoltaic (PV) panels would be on the platform. These panels would provide power to the meters. The panels are about 0.5 m x 2 m.



Source: Ward and Associates

Figure 5 Preliminary Tank Layout

An alarm system on this platform would alert the on-site technician if the flow exceeded or was considerably lower than the prescribed application amounts. The technician would check the valves for damage or constrictions. An additional safety feature would be around the vacuum break area called the vacuum break box. This box would be locked to reduce the risk of tampering with the flow application. A final safety fence (chain link) would also be added around the lower platform to reduce any attraction to the site from people recreating in the area.

2.1.3 Housing

During the 10-12 week treatment period, a field technician would live on site in a fully contained (own water and sewer) 24 ft. long mobile trailer. The technician would be responsible for the operation of the treatment system.

2.1.4 Security and Safety

The onsite technician would use a footpath (about 3 m wide and 30 m long) 2-4 times a day to inspect the pipes from the holding tanks, the flow meters and the wood platform~~transition box~~. The holding tanks would have a berm around them created with sandbags or concrete lock blocks; the tank pad would be ~~and then~~ covered with a layer of sand, a felt matt, and a thick plastic liner to contain any leaks that might occur. The berm and liner around the tanks could capture the entire contents of a full tank if necessary and hold them until the product could be pumped out. Should leaks occur, a submersible pump powered by a 5000-watt generator on site would pump the material into a non-damaged holding tank. If there are any nutrient leaks into the containment area, the liner would be properly cleaned and the waste disposed of. No major leaks should occur because an automated switch would shut off flow should nutrients stream faster than programmed (indicating a break in the line). The shutoff switch would be above the wood platform and the outlet nozzle. If the pipeline has any minor leaks and vegetation is reduced nearby (the opposite could occur), the forest botanist would be consulted for re-vegetation recommendations. Following the treatment season, the tanks would be emptied and the pipe in the river removed until the following season.

The tank area would be enclosed by a chain link fence with neutral colored blinds to reduce any attraction to the site from people recreating in or along the river or upland bench.

A new gate would be installed on the improved access road to limit access to only the landowner and authorized personnel.

During angler surveys performed during the treatment seasons, informational pamphlets about the project would be handed out. These pamphlets would also be available at boat launches and other areas used by recreationists and the general public. Signs would be placed near the outlet pipe to provide information and alert river users of elevated nitrate concentrations at the pipe nozzle prior to mixing (1-2 m; see Section 2.1.1 for more information on mixing zone concentrations).

2.1.5 Power Requirements

Two medium-sized photovoltaic (PV) panels rated at about 100 watts would operate the application system. They would be on the wood platform (see Figure 3A). A deep discharge battery(s) rated at approximately 180 Ah would provide sufficient storage to supply the system during periods of cloudy weather. There would also be a 5,000-watt generator on-site for emergencies. The mobile trailer would have two batteries on the front that can be recharged with the generator.

2.1.6 Research and Monitoring

During the treatment season, meters would measure many types of data for project managers including the dosing rate for each nutrient, the water temperature and river surface level, and the sampling time. The data would be sent to KTOI and IDFG daily so that managers could maintain consistent nutrient concentrations in the river. Data would be transmitted by satellite to project managers by the equipment depicted in Figure 6.

In addition, the Tribe would monitor water chemistry and assess algal production. The Tribe has six bio-monitoring sites between the Yaak River confluence and Bonners Ferry. These sites are already comprehensively sampled for water chemistry, water-borne metals (from water samples), algae, and benthic macroinvertebrates. Monitoring for this project would supplement the monitoring already occurring (Hoyle, February 2005).

IDFG and KTOI personnel would monitor at 11 sites. The first site would be 1 km upstream of the dosing site, followed by a sample collected every 1 km starting at the dosing site. River km 277 through rkm 266 would be sampled weekly for water chemistry, algal taxonomic structure, and blue-green algae production to evaluate the results against specific criteria to test the effects of the treatment (Hoyle, February 2005 and Anders, et al. 2005; available on request).

To evaluate the success of the nutrient additions, general criteria that focus on data trends at each **trophic** level over time would be used. More specifically, the post-treatment data would be evaluated against historical information available, current pre-treatment biomonitoring data collected since 2001, and the desired criteria that researchers from both agencies (KTOI and IDFG) would favor this experiment moving towards. The endpoint or goal of the nutrient restoration project is to enhance and help restore fish communities in the Idaho reach of the Kootenai River and improve angler fishing success. Although restoration of all the fisheries is not expected or required, the nutrient restoration of this proposal would be considered successful as long as the results demonstrate trends toward the desired criteria. Conversely, should trends be viewed as negative, the experiment may be discontinued and re-evaluated by IKERT.

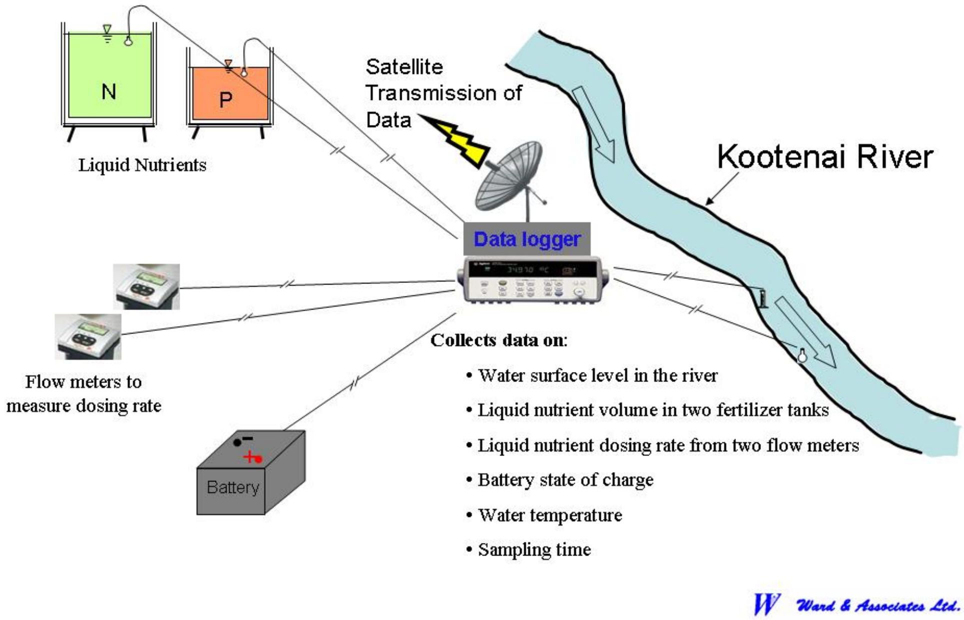


Figure 6 Schematic Layout of Data Logger and Measuring Devices

Weekly water quality testing would allow managers to determine potential cost: benefit factors to determine if the objectives are achievable. The KTOI and IDFG are working directly with nutrient restoration experts (e.g., Ken Ashley, British Columbia Ministry of Land Water and Air) and other ecologists on the International Kootenai River Ecosystem Recovery Team to determine the exact formulation of nutrients needed to achieve the set objectives.

Annual monitoring of the fish community (e.g., relative species abundance and catch-per-unit-effort [CPUE]) would allow the IKERT steering committee to either continue or halt the nutrient restoration program based on "negative threshold" values. Therefore, once these species increase to levels that may affect salmonid production (or other sensitive species such as Kootenai River white sturgeon), or the biomass proportion of salmonid:non-game fish becomes unacceptable (i.e., maximum negative target), the project would be re-evaluated. By the very nature of ecosystem complexity, however, it is difficult to predict such outcomes. In the likelihood of non-game fish species increasing, salmonid populations may also increase to a level that creates a top-down control on these non-game fish communities. Careful evaluation of the trophic interactions within the test period should reveal if species shifts revert back to populations dominated by salmonids (Partridge, 1983).

Adaptive Management

Management criteria of the nutrient additions have been set up to try to safeguard against any long-term deleterious effects of the treatments (see Table 1). In other words, should managers see nutrient additions resulting in potentially negative effects or no apparent benefit (especially within the fish community), the experiment would be discontinued and re-evaluated by the IKERT. Table 1 lists a simplified version of the adaptive management options that may be taken once certain effects are seen in the river. The project sponsors would develop an operations manual and recordkeeping system to collect data on nutrient additions and effects over time, and adapt the project to respond to the results. Should managers see nutrient additions resulting in potentially negative effects, the experiment would be discontinued and re-evaluated by the IKERT.

The detailed monitoring plan is available on request.

Table 1 Potential Outcomes and Possible Management Actions

Potential Outcomes	Trophic Level In Food Web			
	Primary Productivity (Algae)	**Secondary Productivity (Aquatic Insects)**	**Tertiary Productivity (Fish)**	**Management Action**
Outcome a	No increase	No increase	No increase	Stop, re-evaluate experiment
Outcome b	Increases	No increase	No increase	Stop, re-evaluate experiment
Outcome c	Increases	Increases	No increase	Stop, re-evaluate experiment
Outcome d	Increases	Increases	Increases in non-target species only	Stop, re-evaluate experiment
Outcome e	Increases	Increases	Increases in target (and possibly non-target) species	Continue experiment after evaluation period

2.1.7 Site Restoration

If, through the adaptive management process, a decision is made to discontinue this project, the temporary equipment would be removed. The National Forest System Land would be restored to its original condition. The tanks, wood platform, pipes and mobile trailer on private land would likely be removed and the area restored depending on the landowner's wishes. If the landowner allows the tanks to remain on his property, the tanks would be emptied and cleaned so that all nutrients would be removed.

2.2 No Action Alternative

The No Action Alternative is the no funding alternative. BPA would not fund the research and temporary placement of nutrients into the Kootenai River.

2.3 Alternatives Considered but Eliminated from Detailed Consideration

2.3.1 Alternative Treatment Sites

Four sites near the Montana-Idaho border area were considered for the treatment site (see Figure 7). Three sites are in Montana and one is on the Idaho side of the border; all sites are on the north side of the Kootenai River. A fifth site, located in Idaho and on the south side of the river, was briefly considered, but was eliminated early in the selection process because the pipeline would have to cross an active railway line.

Site 1A is the Proposed Action.

Site 1B was eliminated because road construction costs were much higher than site 1A and additional federal property had to be crossed.

Site 1C was eliminated because road construction costs were much higher than sites 1A and 1B, and additional federal property had to be crossed.

Site 2 was eliminated because nutrients would be added well within the boundary of the state of Montana, which does not want nutrients added to its waters during this project (Dunnigan, November 2003).

2.3.2 Nutrient Management Potential of Libby Dam Operation

During the scoping period, some commenters suggested that Libby Dam be operated to increase the nutrients below the dam. Although this may be possible in the future, current dam design and operations preclude this as an option to increase nutrients in the Idaho reaches of the Kootenai River.

Creation of Koocanusa Reservoir by the construction of Libby Dam has altered river dynamics at multiple scales, and has created aquatic and terrestrial environments that have continually adapted to these altered dynamics since the reservoir initially began filling. Among these alterations has been the virtual cessation of nutrient loading from the upper Kootenai/ay watershed to the lower watershed. The downstream nutrient loading effects of dam construction were delayed for several years due to the initial loading of previously terrestrial nutrient sources into the newly created reservoir simply by the process of inundation of those environments; this effect is common when reservoirs are created.

There is an initial increase in available nutrients in newly inundated reservoirs, often expressed in increased fisheries biomass and growth. In addition to the initial increase in productivity in the reservoir, a portion is passed through the dam and is available downstream. As the reservoir ages and nutrient supplies are depleted, the reservoir environment becomes less productive, and thus the availability and passing of nutrients through the dam to the downstream river reaches declines. The nutrient depletion in the Kootenai River over time has been exacerbated by the gradual and steady decline of productivity in Koocanusa Reservoir over the last 30 years.

The dam is equipped with a “selective withdrawal” system, which allows operators to optimize the temperature river below the facility, within certain operational constraints. This system is governed by guidelines developed to enhance growth of trout, as well as other aquatic organisms. However, operation of this system cannot bypass large amounts of nutrients to aid in-river productivity, so the selective withdrawal system cannot be used to influence availability of P and N below the dam. This alternative was eliminated from further consideration.

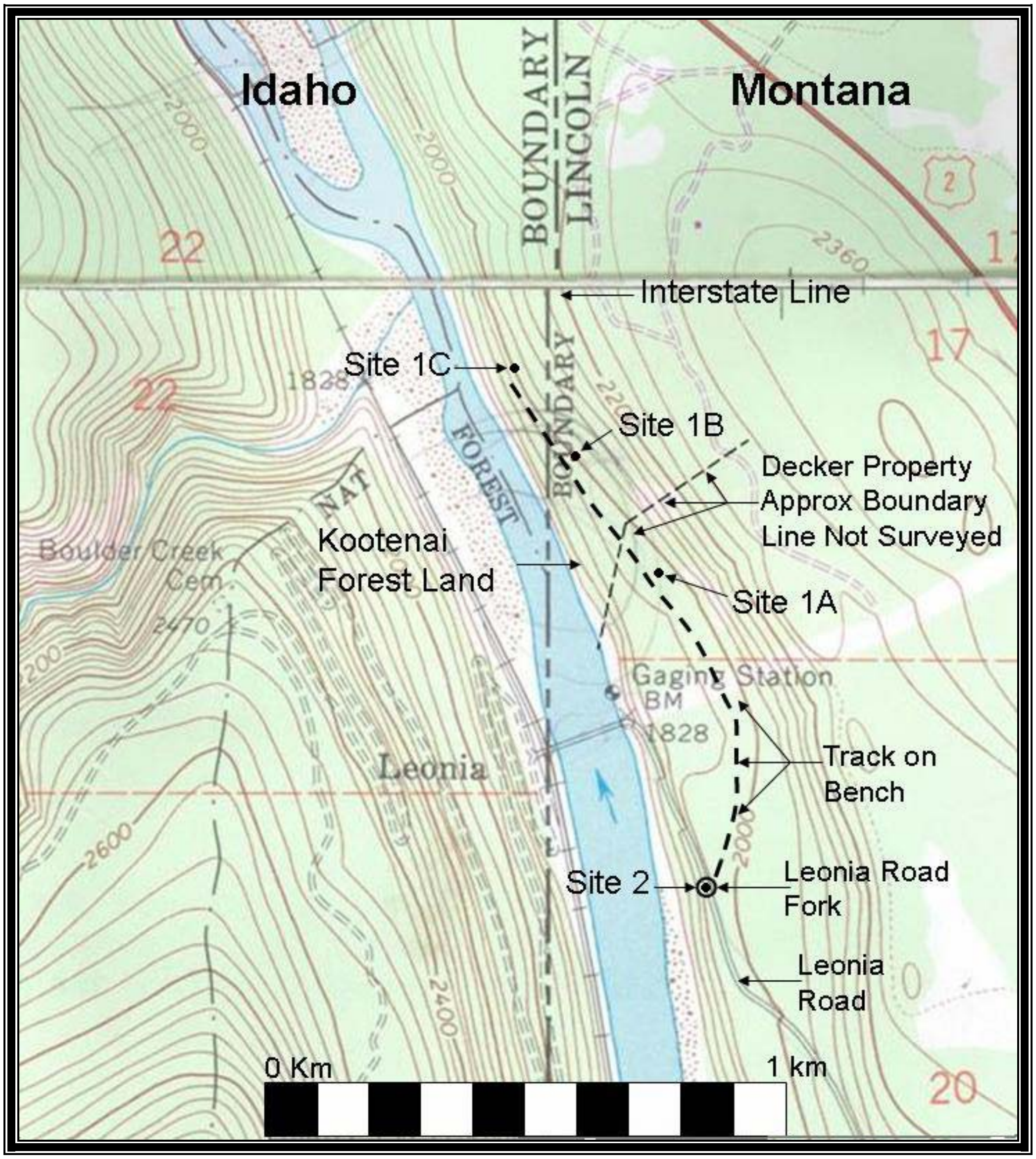


Figure 7 Alternate Treatment Sites. Site 1A is the Proposed Action.

2.4 Comparison of Alternatives

This section compares the alternatives described in this chapter using the project purposes and the predicted environmental impacts. Tables 2 and 3 summarize the environmental impacts and compare the alternatives.

Table 2 Environmental Impacts of Alternatives

Environmental Resource	Existing Conditions	Proposed Action	No Action Alternative
Fish and Wildlife	Variety of animals and habitats. Threatened and endangered fish and mammals.	Animals likely to move during construction. If successful, treatment would benefit the river ecosystem, including threatened and endangered species. No threatened or endangered species would be adversely affected.	No new impacts expected. Current impacts to the Kootenai River ecosystem would continue.
Land Use	Private timberland and ~~n~~National ~~f~~Forest ~~s~~System ~~l~~Land.	Access road improved. Some trees removed for gravel pad for tanks. Security measures proposed to prevent impacts from accidental leaks. Temporary equipment used, some removed each season.	No impacts expected.
Visual Resources	Rural, scenic area with river and mountain views. High visual quality should be maintained.	Tanks should not be visible from the river. Pipe would blend with rock and vegetation. Tanks would be colored to blend with local vegetation. A chain-link fence with neutral blinds would screen the area. Viewshed of river users may be altered slightly.	No impacts expected.
Recreation	Area has many recreation opportunities, but none on site. Fishing, boating, hiking in general area.	Pipe in the river would be submerged and would not pose a hazard and would be removed after treatment. If ecosystem improves, fish and other wildlife may increase for recreation.	No impacts expected.
Water Resources	River is nutrient deficient. The river is used for municipal and residential water.	Water quality would be monitored. No impacts to human health are expected. Nutrients may improve river productivity.	No new impacts expected. Current impacts to the Kootenai River ecosystem would continue.
Wetlands	One riverine wetland along the shore at the treatment site.	No construction would occur in the wetland. No wetlands would be affected.	No impacts expected.
Floodplains	The tank site is outside the floodplain. The riverbank is bounded by steep slopes.	No floodplains would be affected.	No impacts expected.

Environmental Resource	**Existing Conditions**	**Proposed Action**	**No Action Alternative**
Cultural Resources	Native American groups and bands frequently used the area.	No prehistoric resources found. A portion of an historic road would be improved with fill material, but would not be adversely impacted.	No impacts expected.
Vegetation	Vegetation includes mostly second growth timber. One listed plant.	Some trees would be removed at the tank site. Low-growing vegetation would be disturbed. Disturbance would be minor. No impact to the listed plant.	No impacts expected.
Soils	Existing soils have low fertility, and steep slopes.	Soils would be disturbed as vegetation is removed for construction. Erosion may increase temporarily. Erosion control measures would be used.	No impacts expected.
Noise, Public Health and Safety	Area of private property and National Forest System Lands. Traffic and railroad noise occur frequently.	Noise and human disturbance would increase temporarily. Tanks would be refilled using motorized vehicles 2-4 times per season. A berm would surround the tanks to control potential leaks. Onsite personnel would provide security, as would fencing, an alarm and a locked gate. Warnings would be posted for recreationists using the river during the treatment season.	No impacts expected.

Table 3 Alternatives Compared to Project Purposes

Project Purposes	Proposed Action	No Action Alternative
Helps BPA fulfill its obligation to protect, mitigate, and enhance fish and wildlife affected by the development of Libby Dam in a manner consistent with the Council's Columbia Basin Fish and Wildlife Program.	Provides a potential enhancement of the Kootenai River ecosystem, which was affected by Libby Dam. Is consistent with the Council's Program.	Does not help BPA fulfill its obligation.
Enhances administrative efficiency and cost-effectiveness.	Uses temporary facilities to lower overall costs. Equipment can be sold or used for other projects if treatment is unsuccessful.	No cost alternative.
Avoids or minimizes adverse environmental impacts.	Monitoring the success of the treatment is part of the project so treatment can be suspended if adverse impacts are created. Use of temporary equipment reduces land disturbance. Mitigation provided for security, safety and visual resources reduces impacts.	No new environmental impacts. Current impacts to the Kootenai River ecosystem would continue.
Provides the potential to achieve the following biological objectives: Rehabilitates the post-development Kootenai River ecosystem; rehabilitates the ecosystem to reverse declining trends in native populations of kokanee, burbot, interior redband trout, and ESA listed populations of bull trout and white sturgeon.	The treatment, if successful, would contribute to the rehabilitation of the ecosystem.	The biology of the Kootenai River system would remain as it is today, with reduced levels of nutrients.
Helps improve a fishery important to the Kootenai Tribe of Idaho, consistent with BPA's general trust responsibility to the Tribe.	Provides potential benefit to the Kootenai Tribe of Idaho if the fishery is improved.	The fishery would not improve without other projects or measures.